



# **GLAST Large Area Telescope Calorimeter Subsystem**

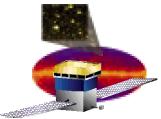
## **11.0 Mechanical Ground Support Equipment**

**Paul V. Dizon**  
**Naval Research Lab, Washington DC**  
**Calorimeter Lead Mechanical Systems  
Engineer**

**paul.dizon@nrl.navy.mil**  
**(202)-404-7193**

Naval Research Lab  
Washington DC

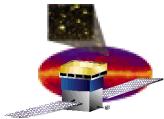




# NRL Mechanical GSE

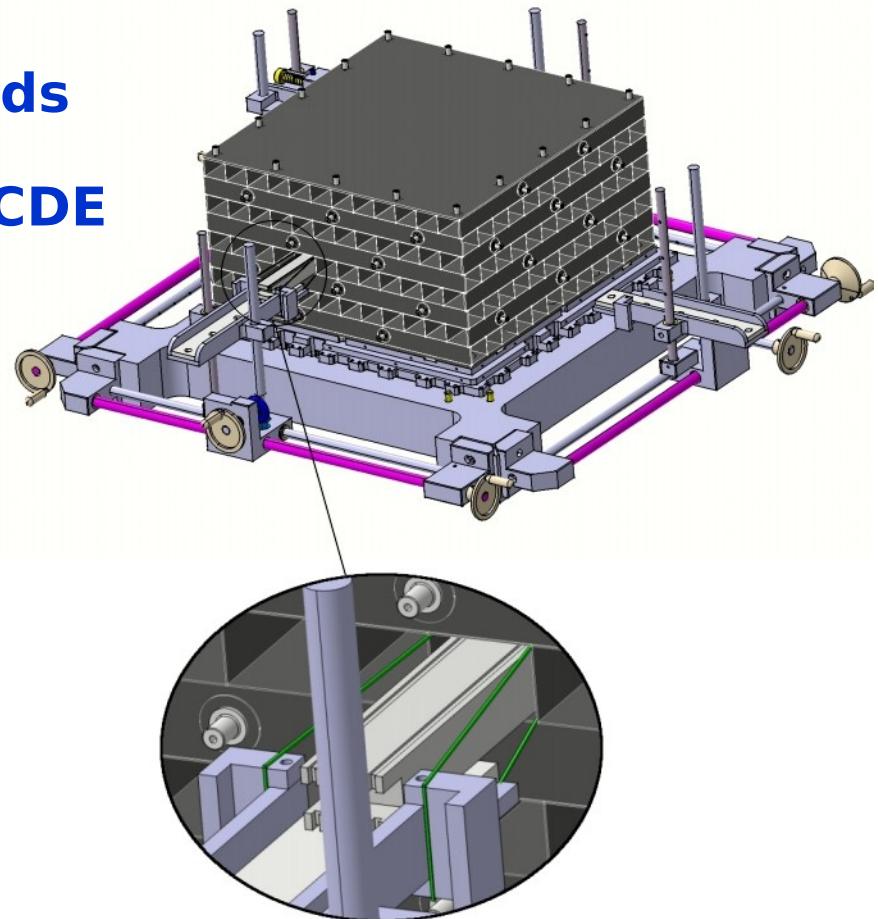
SUPPORT EQUIPMENT	DRAWING NUMBER	STATUS
<b>ASSEMBLY TOOLING</b> - CDE Insertion Tooling CDE Insertion Tooling, Top Level Assembly - PEM Assembly Tooling AFEE Board Integration Tooling	LAT-DS-01521 LAT-DS-01520	Modification to Current EM Design is On-Going  Fabrication is Complete
<b>TEST FIXTURES</b> - TVAC Test Fixture CAL Thermal Vacuum Test Fixture, Top Level Assembly CAL TVAC Test Fixture, Plate, Base CAL TVAC Test Fixture, Bar, Support CAL TVAC Test Fixture, Plate, Side CAL TVAC Test Fixture, Plate, Top CAL TVAC Test Fixture, Isolator, Base CAL TVAC Test Fixture, Isolator, Side CAL TVAC Test Fixture, Isolator, Top CAL TVAC Test Fixture, Washer, Shoulder  - Vibration Test Fixture CAL Vibration Test Fixture, Top Level Assembly CAL Lift Fixture, Plate, Base CAL Lift Fixture, Channel, Short CAL Lift Fixture, Channel, Long CAL Lift Fixture, Plate, Short CAL Lift Fixture, Plate, Long  - EM Translation Stage	LAT-DS-01361 LAT-DS-01362 LAT-DS-01363 LAT-DS-01364 LAT-DS-01365 LAT-DS-01366 LAT-DS-01367 LAT-DS-01368 LAT-DS-01369  LAT-DS-01514 LAT-DS-01515 LAT-DS-01516 LAT-DS-01517 LAT-DS-01518 LAT-DS-01519  N/A	Detailed Design is Complete. Fabrication is On-Going  Detailed Design is Complete. Fabrication is On-Going
<b>GROUND SUPPORT EQUIPMENT</b> - EM Lift Fixture CAL Lift Fixture, Top Level Assembly CAL Lift Fixture, Corner Fixture CAL Lift Fixture, Spreader Bar  - EM Handling Fixture CAL Handling Fixture, Top Level Assembly CAL Handling Fixture, Base Plate CAL Handling Fixture, Posts  - CAL Shipping Container  - Rotation/Assembly Stand	LAT-DS-01526 LAT-DS-01527 LAT-DS-01528  LAT-DS-01523 LAT-DS-01524 LAT-DS-01525  LAT-DS-01522  N/A	BTEM Fixture Exists  Fabrication of EM Fixture is Complete  Fabrication of EM Fixture is Complete. Design of Flight Fixture is Complete.  Preliminary Design is On-Going  Modifications to Existing Fixture is Complete

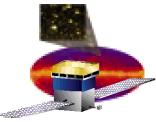




# Assembly Tooling

- **CDE Insertion Tooling**
  - Secures Elastomeric Cords in Tension
  - Supports and Positions CDE During Insertion

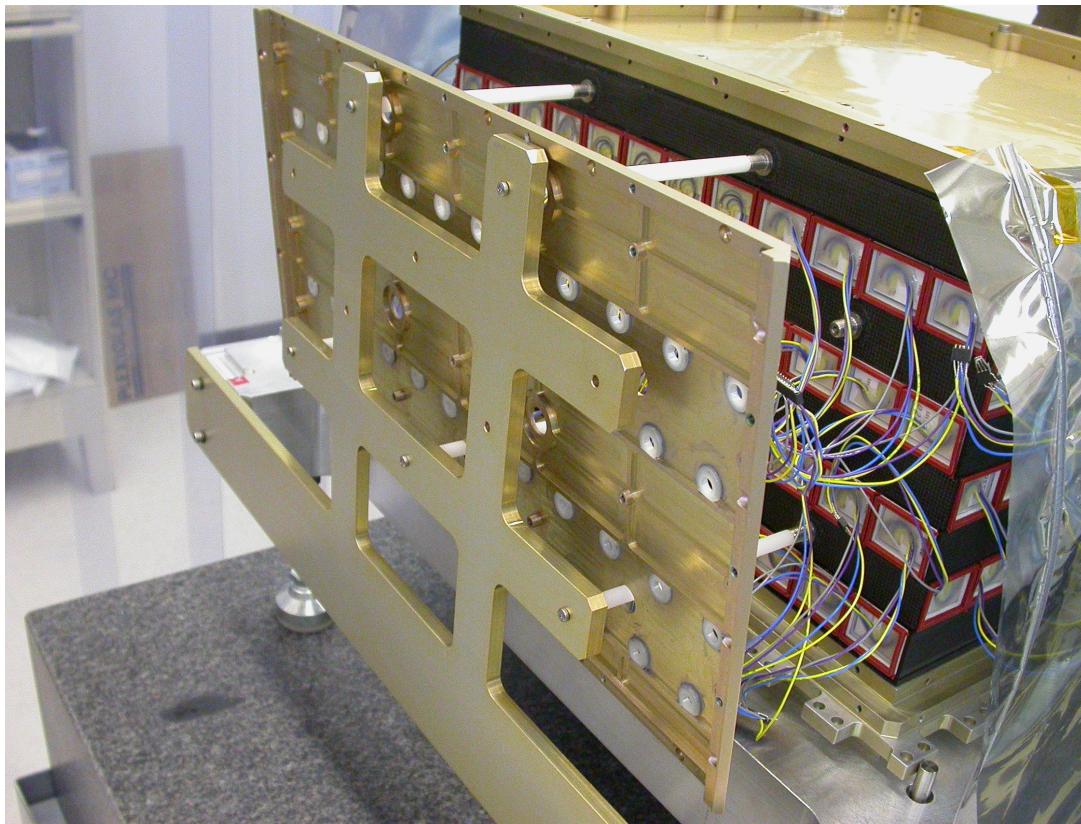


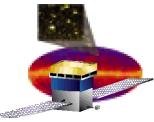


# Assembly Tooling

---

- **PEM Assembly Tooling**
  - Supports Close-Out Plates During PEM Assembly
  - Supports AFEE Cards During PEM Assembly



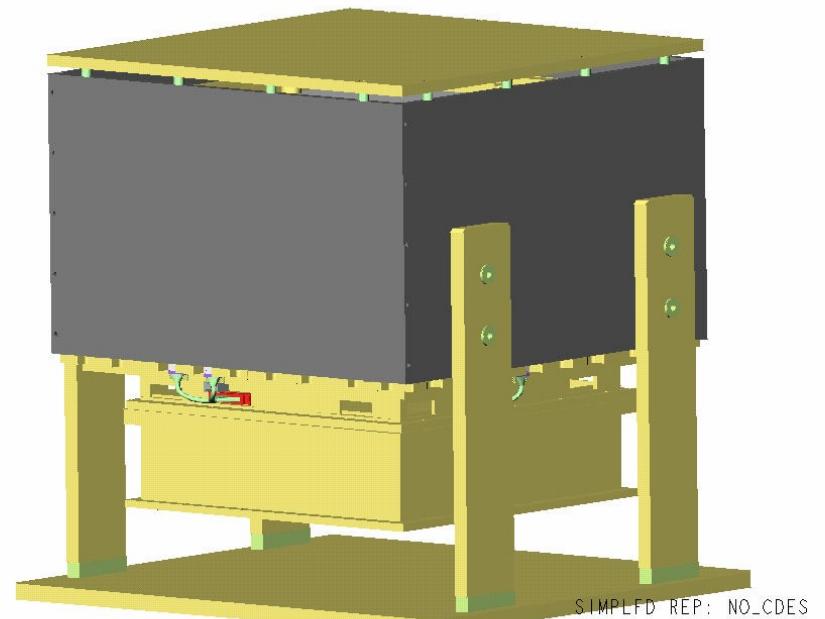


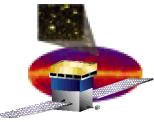
# Test Fixtures

---

## □ TVAC Test Fixture

- Supports CAL Module-TEM/TPS Assembly during TVAC Testing
- Represents Inside Surface of LAT-Grid
- Designed For Cold-Biased Test Environment. Heaters Attached to Fixture Control Temperature.
- Cold Plate Attached to TEM/TPS Represents X-LAT Plate



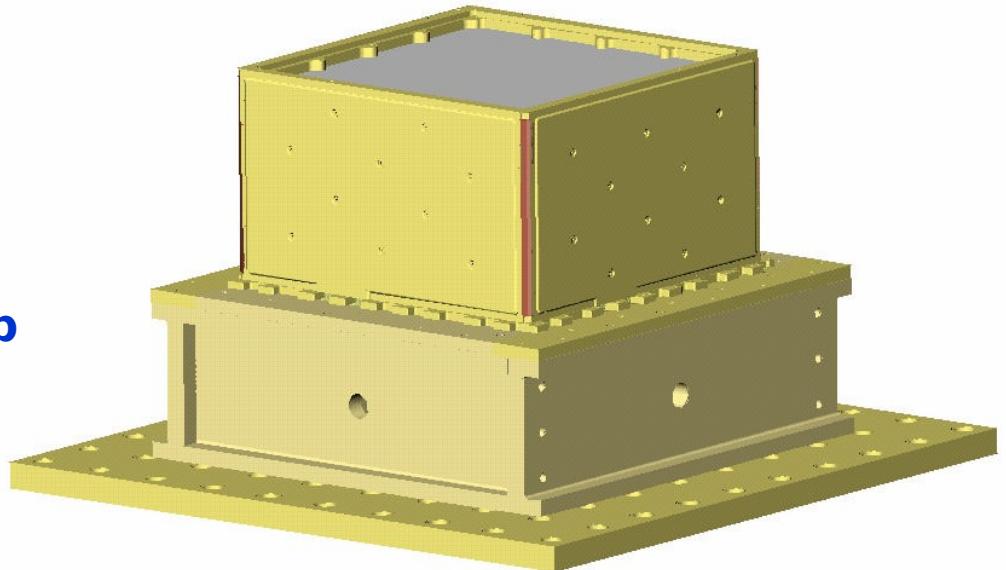


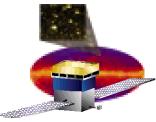
# Test Fixtures

---

## □ Vibration Test Fixture

- Supports CAL Module-  
TEM/TPS Assembly
- Attachment Represents  
Flight CAL Tab-Grid  
Interface
- Used for All Structural  
Environment Test  
Activities:
  - Low-Level Sine Sweep
  - Random Vibration
  - Sine Burst





# Test Fixtures

---

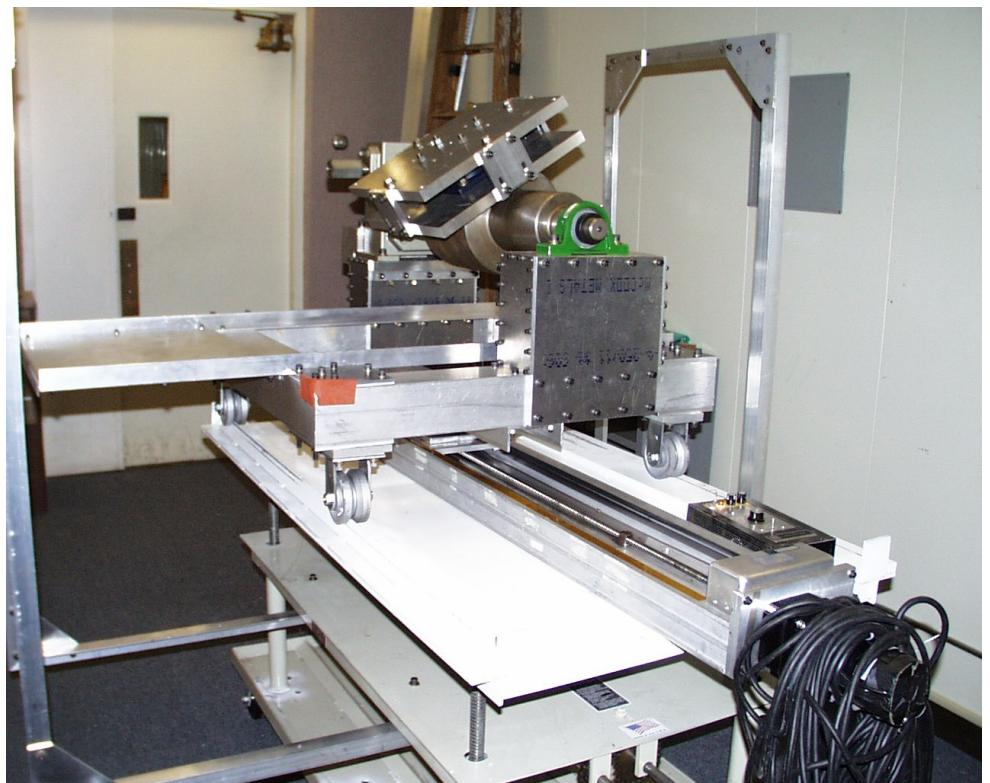
## □ EM Translation Stage

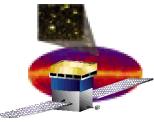
- **Rotation/Assembly Stand Attaches to System**
- **Allows Mapping of EM in Accelerator Beams**
- **Includes Support for Ancillary Detectors**

## □ Requirements

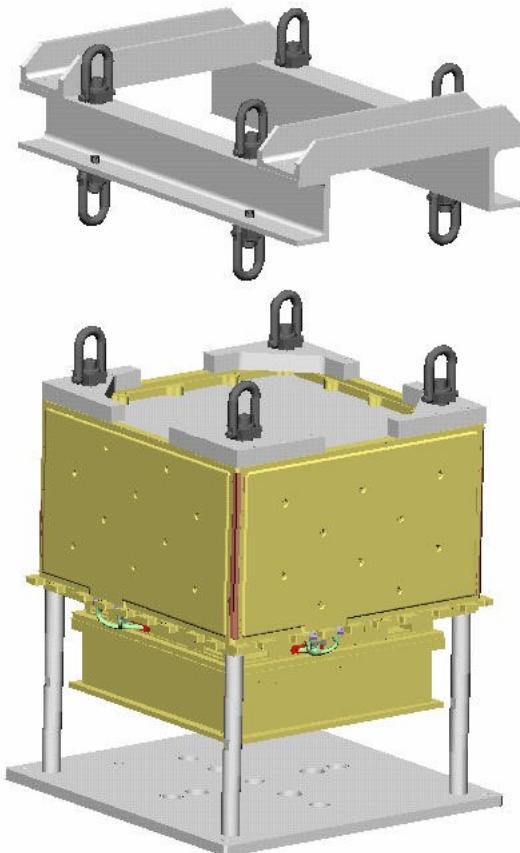
- **>40 cm 2D Motion**
- **<1 mm Accuracy**
- **90 deg Pitch Rotation**
- **<1 deg Accuracy**
- **>120 kg Capacity**

BTEM prototype



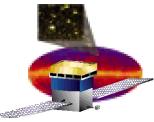


# Ground Support Equipment



## □ Lift Fixture

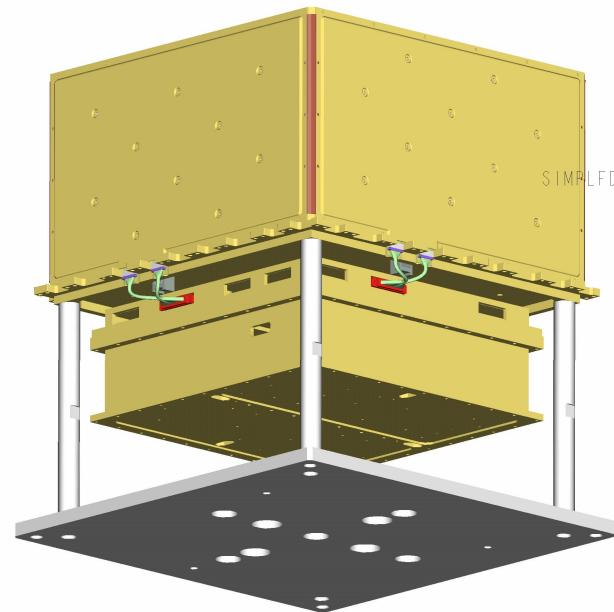
- **Distributes Lift Load During Crane Operations**
- **Consists of:**
  - **4 Corner Brackets**
  - **1 Spreader Frame**
  - **Nylon Slings**

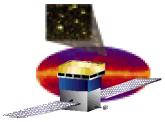


# Ground Support Equipment

## □ Handling Fixture

- Supports CAL Module - TEM/TPS Assembly
- Provides Interface to the Following MGSE:
  - Shipping/Storage Container for Testing and Storage
  - LAT-Rotation/Assembly Stand (NRL)
  - LAT-Grid Integration Tooling (SLAC)
    - Turn-Over Fixture
    - LAT-Grid Lift Fixture
    - LAT-Grid Alignment Tool

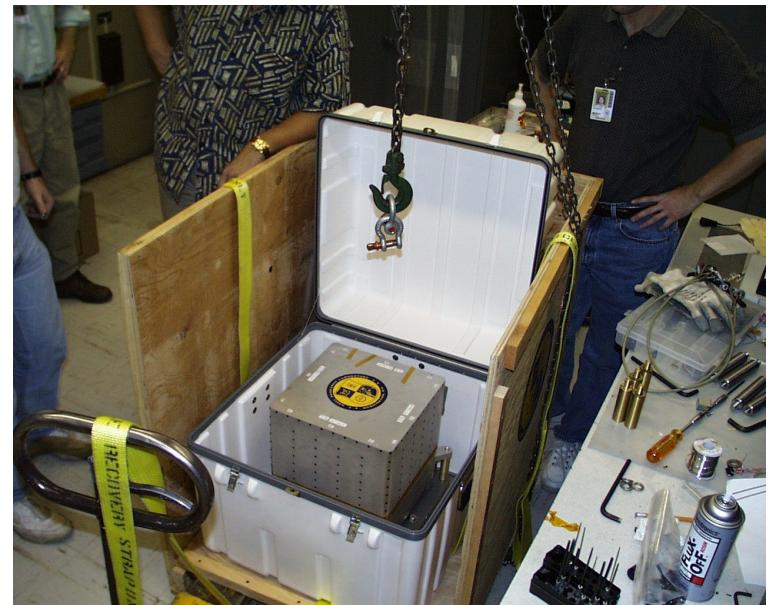


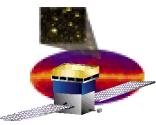


# Ground Support Equipment

---

- **CAL Shipping/Storage Container**
  - **Outer Shipping Container**
    - Wheeled Dolly with Cover
  - **Inner Pressure Housing**
    - Provides Dry Nitrogen Environment
  - **Shock-Mount Suspension**
  - **1 Container per Module**

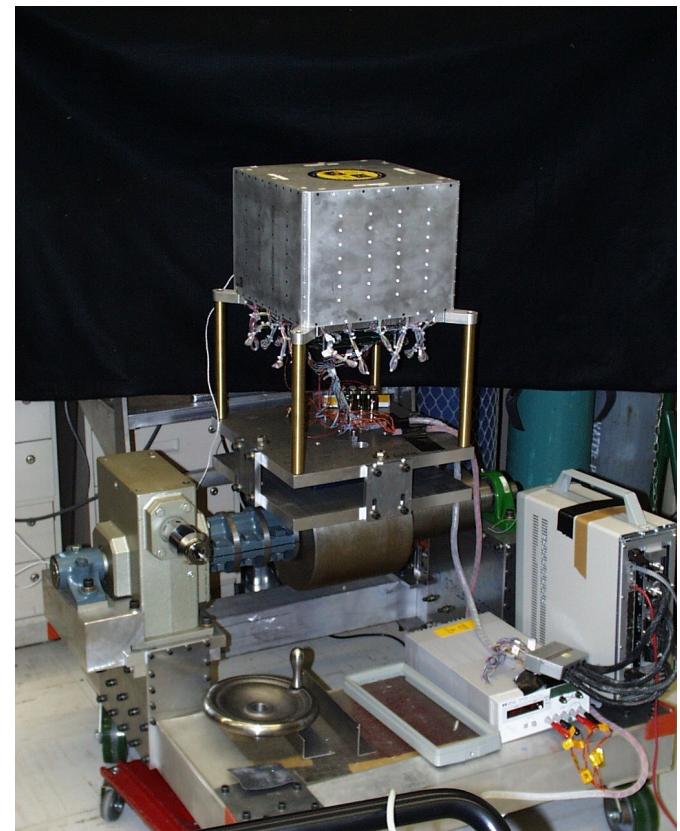




# Ground Support Equipment

## □ Rotation/Assembly Stand

- Existing Fixture - BTEM Rotation / Assembly Stand. Will be Duplicated for Flight
- Modified to Support CAL EM Module
- Allows Assembly Technician and Engineer Easy Access to Each Side of CAL in Horizontal, Vertical or Any Pitch
- Used for AFEE Card Integration
- Interfaces to EM Translation Stage to Support Beam Testing



BTEM prototype

